TURNER DESIGNS
Reliable Instruments for an Unreliable World

C6 Multi-Sensor Platform

User's Manual

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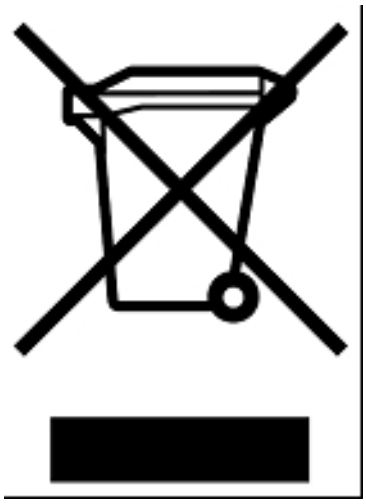
Multi-Sensor Platform

Table of Contents

Table of Contents *2*
1.0 Introduction *5*
Important Note Regarding Use of Fluorescein Sensor 5
2.0 Inspection and Setup *6*
2.1 Instrument Checklist 6
2.2 Getting Started 8
2.2.1 Installing Cyclops-7 Sensors 8
2.2.2 Installing the Mechanical Wiper 9
Overview 9
Benefits 9
Installation 9
2.2.3 Installing the Flow Cap 10
Overview 10
Installation 10
3.0 C-Soft Windows™ User Interface *11*
3.1 Software Installation and PC Requirements 11
3.1.1 Minimum PC Requirements 11
3.1.2 Software Installation 12
3.1.3 PC Software Interface 12
3.2 Software Operation 13
3.2.1 Settings Screen 13
3.2.2 Current Data and Calibration Screen 14
Current Data 14
Tabular Screen 14
Waveform Screen 15
Calibration Screen 16
3.2.2.1 Direct Concentration Calibration 17
3.2.2.2 Raw Fluorescence Calibration – Blank Subtracted 18
3.2.2.3 Raw Fluorescence Calibration 19
3.2.2.4 Depth Calibration 19
Atmospheric Offset 19
Atmospheric and Gravity Offset 19
3.2.3 Log Setup Screen 20
3.2.4 Downloading and File Management 22
3.2.5 Enabling Data Output Ready State 22
Integration Cable for Digital (ASCII) Output 23
3.2.6 How to setup Hyperterminal for Digital (ASCII) Data Capture 24
4.0 Deployment *26*
4.1 Connecting the Submersible Battery Pack 26
4.2 Battery Bracket Installation 26
5.0 Maintenance and Warranty *27*
5.1. Rinsing 27
5.2 Care for the bulkhead connector 27
5.3 Care for the sensor ports 27
5.4 Terms 27

5.5 Warranty Service 27
5.6 Out-of-Warranty Service 28
Appendix A. Specifications *30*
Appendix B. C6 Multi-Sensor Platform Operating Instructions *31*
Description 31
Identification 31
Recommended Measurement Practices 31
Appendix C. C6 Multi-Sensor Platform Wiring Guide *32*
Appendix D. Using the Secondary Standard *33*
Solid Secondary Standard Benefits: 33
The Solid Secondary Standard provides a very stable fluorescent signal. It has an adjustment screw so that you can tune the Solid Standard to provide a signal to match a specific sample. **Installing the Secondary Standard** 33
Use of the Solid Secondary Standard: 34
Linear Range and Quenching 35
Temperature Considerations 35



Equipment Specified as Electrical and Electronic Waste

1.0 Introduction

The C6 Multi-Sensor Platform was designed to integrate up to six Cyclops-7 submersible sensors for extended or short-term deployments. The C6 Multi-Sensor Platform provides automatic gain control, calibration, digital data reporting, data logging and digital data output for each Cyclops-7 sensor. The C6 Multi-Sensor Platform comes with factory installed temperature and pressure sensors and is rated to a depth of 600 meters. The C-Soft Windows™ based user interface allows for intuitive calibration, data loggings set up, and file downloading. Existing Cyclops-7 users can easily integrate their sensors into the C6 Multi-Sensor Platform.

Available Cyclops-7 Sensors:

- *In Vivo* Chlorophyll a
- Blue Green Algae (Phycoerythrin)
- Blue Green Algae (Phycocyanin)
- CDOM
- Turbidity
- Crude Oil
- Refined Oil/Fuels
- Rhodamine Dye
- Fluorescein Dye (See note below)
- Optical Brighteners
- Custom Optics

Important Note Regarding Use of Fluorescein Sensor

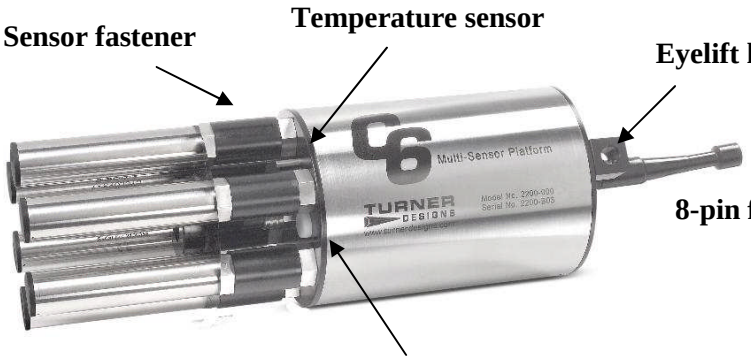
The Fluorescein sensor, when enabled with other sensors, specifically Chlorophyll and Rhodamine sensors, for simultaneous data collection will produce unreliable results. Therefore, the Fluorescein sensor should not be used for simultaneous data collection with Chlorophyll or Rhodamine sensors. All other sensors can be used simultaneously with the Fluorescein sensor.

2.0 Inspection and Setup

2.1 Instrument Checklist

The C6 Multi-Sensor Platform package (P/N: 2200-000) includes:

- C6 Multi-Sensor Platform
- Factory installed pressure sensor
- Factory installed temperature sensor
- Interface cable for PC with 12V power supply
- Sensor fasteners
- 8-pin female plug
- CD includes C-Soft software, user's manual and quick start guide



Computer interface cable

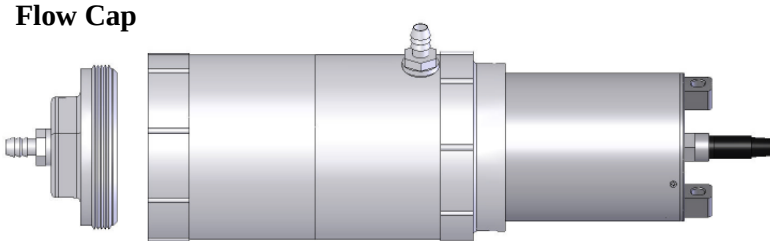
12V power supply

6-pin male plug

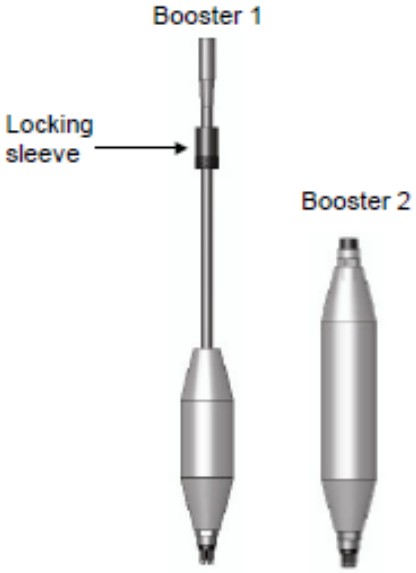
Optional Accessories:

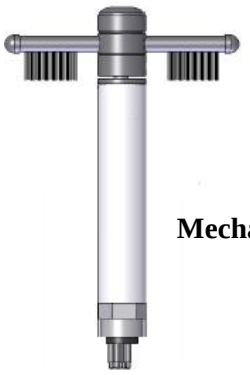
- Submersible Battery Kit includes charger (P/N: 2200-601)
- Turner Designs Mechanical Wiper (P/N: 2200-450) and Replaceable Brush (P/N: 2200-460)
- Submersible Battery Bracket (P/N: 2200-603)
- 6-pin male plugs (P/N: 105-2210)
- 2 foot Integration Cable (P/N: 2200-160) or 5 meter Integration Cable (P/N: 2200-165)
- Flow Cap (P/N: 2200-700)
- Shade Cap (P/N: 2200-500)
- Booster Kit (P/N: 2200-900)
  Note: Booster Kits are required for cable lengths greater than 10 meters.
- Extended Cables:
  - 10 meters (P/N: 105-2595)
  - 25 meters (P/N: 105-2596)
  - 50 meters (P/N: 105-2597)
  - Custom lengths available upon request

Flow Cap



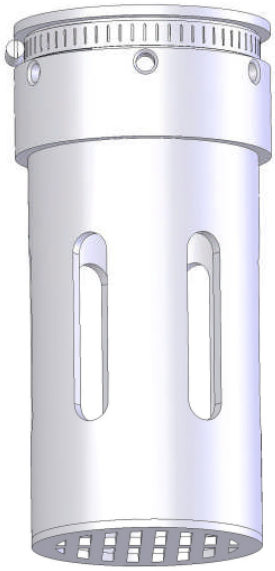
Submersible battery





Mechanical wiper

Shade Cap



Battery bracket

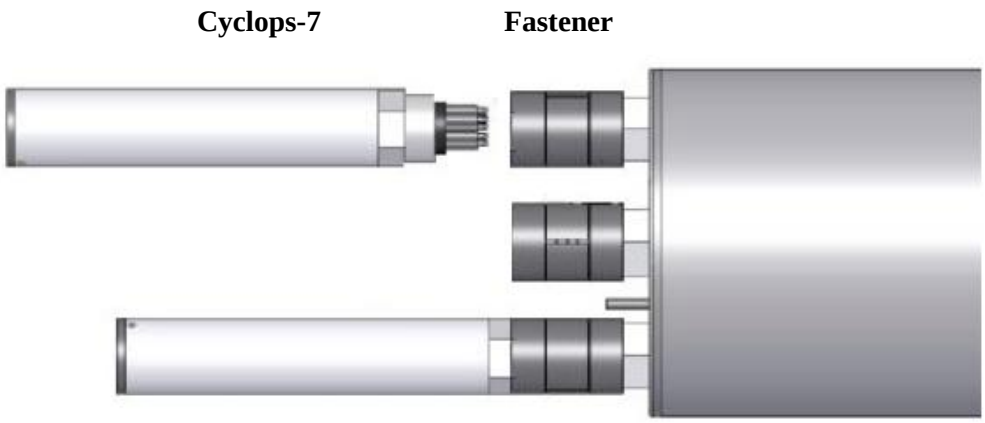
2.2 Getting Started

2.2.1 Installing Cyclops-7 Sensors

Up to six Turner Designs Cyclops-7 sensors can be installed into the C6 Multi-Sensor Platform. ***The center port is intended for the optional mechanical wiper only.*** Follow the instructions below to successfully integrate your Cyclops-7 sensor.

1. Place the fastener on one of the Cyclops-7 ports of the C6 Multi-Sensor Platform and rotate to tighten. Make sure not to over tighten.
2. Align the 6-pin male end of the Cyclops-7 sensor with the C6 Multi-Sensor Platform port and fastener.
3. Hold the Cyclops-7 in place and rotate the remaining ring to tighten. This will lock the Cyclops-7 into position.
4. Follow the same installation instructions for the remaining Cyclops-7 sensors.
5. Install a 6-pin male plug into any unused port on the C6 Multi-Sensor Platform.

****The center port is for the mechanical wiper only***



2.2.2 Installing the Mechanical Wiper

Overview

The C6 Multi-Sensor Platform's mechanical wiper is an optional accessory that can be easily installed to eliminate bio-fouling during extended deployments. The wiper uses non-destructive brush material to clean Cyclops-7 sensors allowing for accurate readings under extreme bio-fouling conditions. Users are able to select the number of wiper rotations before sampling.

Benefits

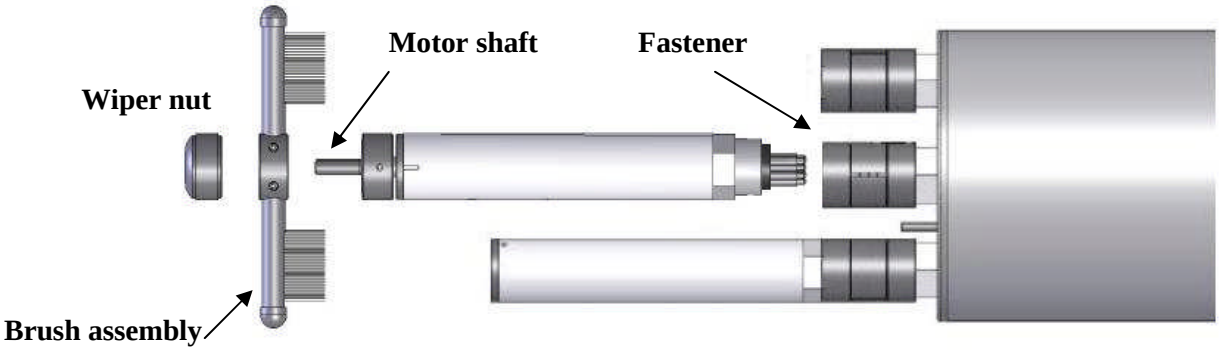
- Limits debris and bio-fouling organisms from interfering with readings
- Easy installation
- Stainless steel housing prolongs motor life
- Easy brush replacement design
- Adjustable wiping revolutions

Installation

The mechanical wiper has a 6-pin male end that fits into the center port on the C6 Multi-Sensor Platform and can be locked into place, limiting movement during transportation, deployment, and retrieval.

1. Place the fastener on the center port of the C6 Multi-Sensor Platform and rotate to tighten. Make sure not to over tighten.
2. Align the 6-pin male end of the mechanical wiper with the C6 Multi-Sensor Platform center port and fastener.
3. Hold the mechanical wiper in place and rotate the remaining ring to tighten. This will lock the wiper into position.
4. Open the C-Soft software (See section 3.0).

In the Log Setup screen click the "Test Wiper" button to **home** the wiper motor.
The mechanical wiper will make one revolution setting the wipers motor shaft to its home position.



5. Slide the wiper brush assembly over the wiper motor shaft.
6. Position the wiper brush between the Cyclops-7 optical heads.
7. Hand tighten the wiper nut to lock the brush assembly into position.
8. Click the "Test Wiper" button to ensure wiper will home to that position.
   Note: Install a 6-pin waterproof plug into the center port when wiper is not installed

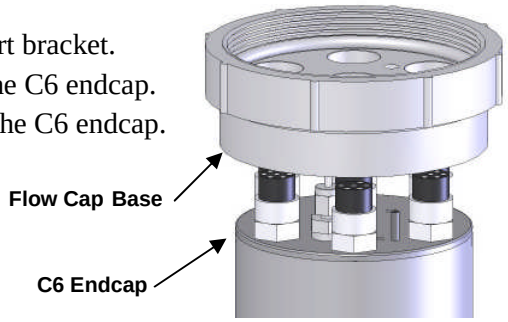
2.2.3 Installing the Flow Cap

Overview

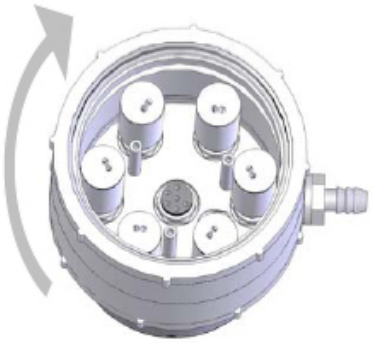
The C6 Multi-Sensor Flow Cap was designed to enable flow through mode and can be configured with other instruments with online flow through systems. The flow cap eliminates the possibility of ambient light interference and it can be used as a calibration cup for holding standard solutions when calibrating Cyclops-7 units. The flow cap also offers protection for Cyclops-7 units during deployment or transportation and will help limit bio-fouling.

Installation

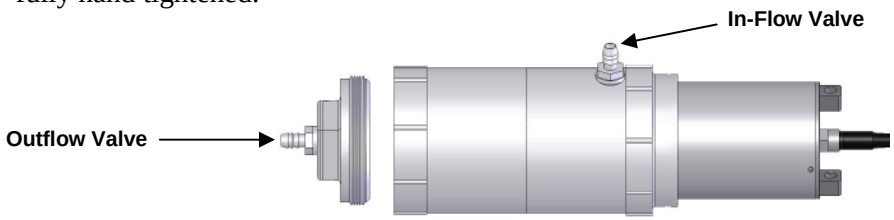
1) Use a screwdriver to remove the screws that fasten the C6 Multi-Sensor Platform's support bracket.
2) Remove the C6 Multi-Sensor Platform's support bracket.
3) Unscrew the 3 stainless steel rods attached to the C6 endcap.
4) Position and mate the base of the Flow Cap to the C6 endcap.



5) Screw in the 3 stainless steel rods into their original positions on the C6 endcap.
6) Turning clockwise, fully thread the Flow Cap housing onto the Flow Cap base connector.



7) Turning clockwise, thread the Flow Cap's endcap to the Flow Cap housing until it is fully hand tightened.



Note: Turner Designs recommends the above flow design for the Flow Cap. It is recommended to position the instrument vertically with the sensor head facing upward to expel any air from the system that might cause skewed readings.

3.0 C-Soft Windows™ User Interface

The C-Soft Windows™ based user interface allows for intuitive calibration, data loggings set up, and file downloading.

3.1 Software Installation and PC Requirements

3.1.1 Minimum PC Requirements

- 133MHz microprocessor
- 600 X 800 VGA resolution
- Microsoft Windows™ 95
- 32 MB RAM

3.1.2 Software Installation

1. Exit all Windows™ programs
2. Insert the C-Soft CD (also located on the Turner Designs Software webpage, http://www.turnerdesigns.com/t2/sw/main.html).
3. Open the C-Soft software folder and double click on the setup icon.
4. Double click on the “setup.exe” icon to begin installation.
5. The software will automatically be installed in the PC’s (C:/Program Files/C6) folder unless user selects alternate location.
6. After restarting the PC double click on the “C-Soft" icon located on the desktop.

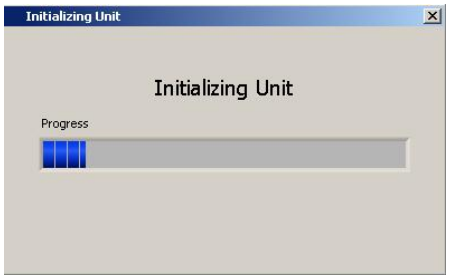
Note: You may receive a warning message asking if you want to unblock messages, select "Unblock"

3.1.3 PC Software Interface

1. Connect the 9-pin serial end of the interface cable into the serial port on the back of the PC.

   Note: If your computer only has USB ports we recommend purchasing a USB to serial adapter cable. (See Turner Designs Support webpage for recommendations).

2. Connect the 8-pin female end of the interface cable to the 8-pin male connector on the C6 Multi Sensor Platform.
3. Connect the interface cable’s 12V pin to the 12V power supply.
4. Plug the 12V power supply into a power source.
5. Wait for initialization process to complete.



6. The connection icon, located on the upper right of the screen, will turn green if connected.

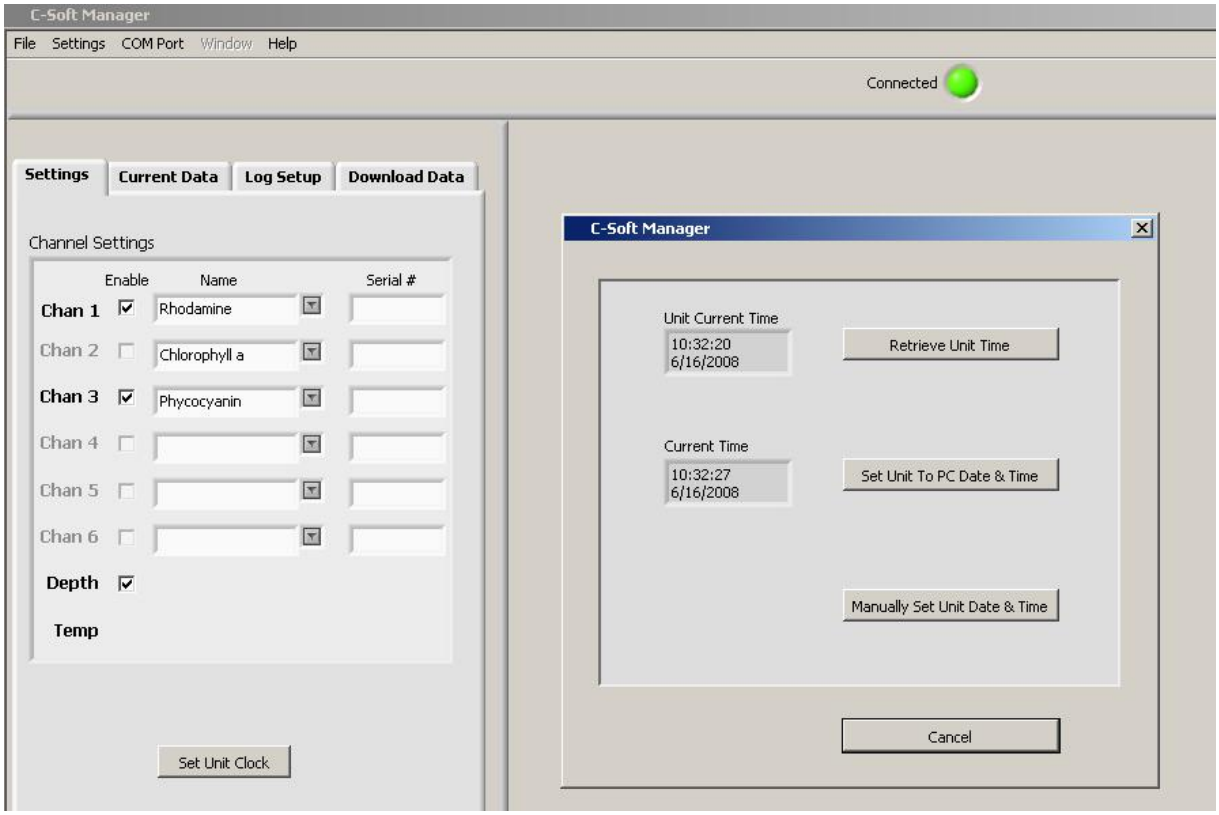
Note: If the connection icon does not turn green disconnect and reconnect power.

3.2 Software Operation

3.2.1 Settings Screen

The Settings Screen allows users to set the time and date, identify each Cyclops-7, update serial numbers and select sensors to be enabled.

- Users can manually set the date and time or choose to synchronize the C6 Multi-Sensor Platform to the PC date and time.
- Each channel (1-6) in the Settings Screen has a port associated with it on the C6 Multi-Sensor Platform that is numerically labeled (1-6) respectively.
- Click on the box adjacent to the channel to enable channel operation. If there is no sensor installed users will be unable to select that channel.
- Channels can be renamed using the dropdown selections or by manually entering a name.
- Channels can also be named using Cyclops-7 serial numbers.
- Settings will automatically be saved after exiting the Settings screen.



3.2.2 Current Data and Calibration Screen

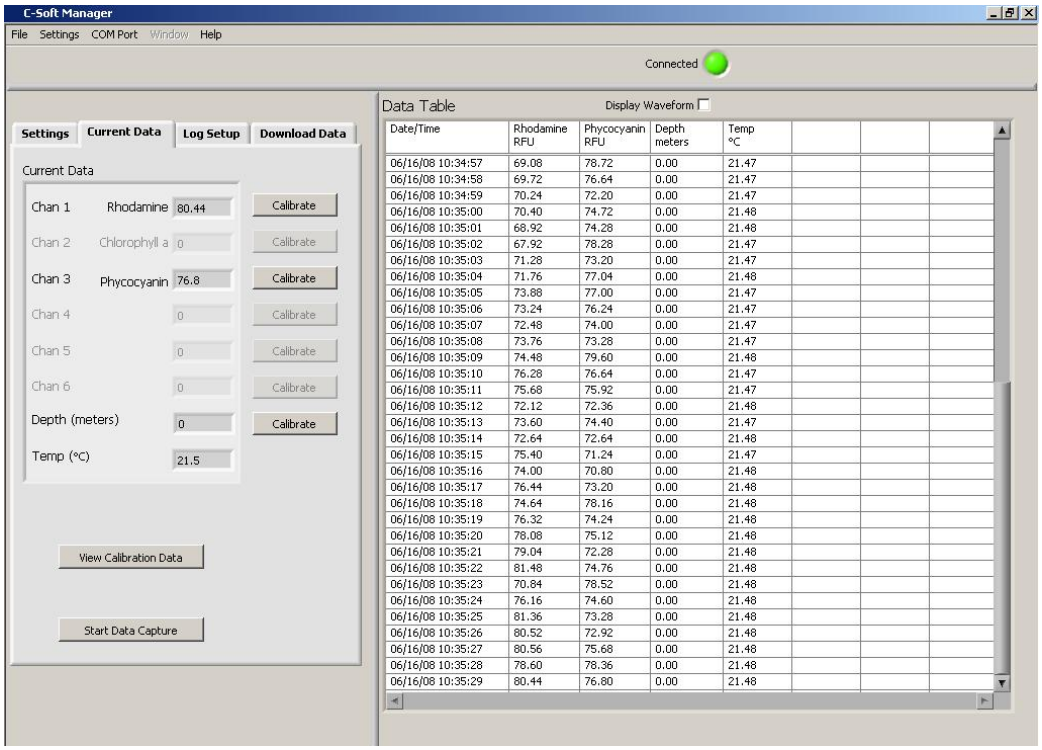
The Current Data Screen allows users to view real-time data acquisition, in both tabular and waveform formats as well as conduct calibrations for each channel.

Current Data

- Sensor labels are displayed but cannot be changed in the Current Data screen.
- Real-time values are displayed next to each channel and in the adjacent Data Table.
- A calibration button is available for all Cyclops-7 sensors and the depth sensor.
- Real-time data can be saved by selecting the “Start Data Capture” button. Users will be prompted to enter a file name and file location. Data files will be saved in (*.csv) format.

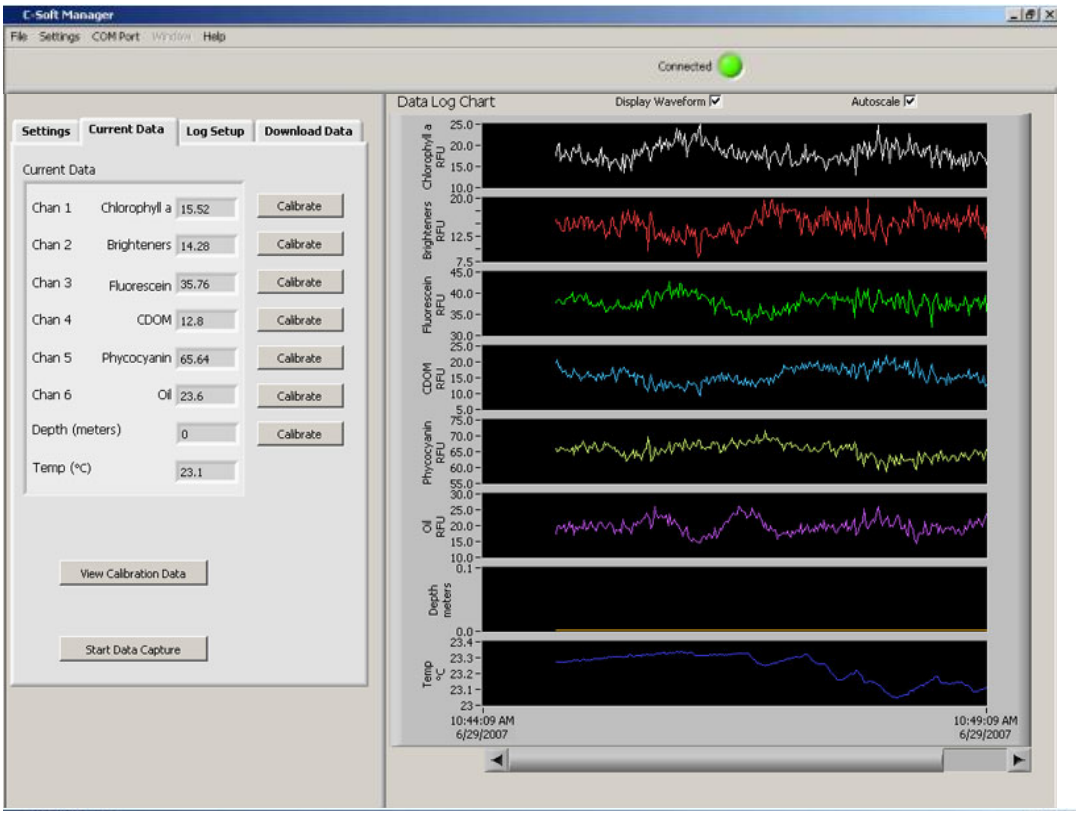
Tabular Screen

- Real-time data including time, date, and units are continuously scrolling on the tabular screen for enabled sensors.
- Each sensor identification name will appear in the associated column headings.
- If units are not selected during calibration a relative fluorescence units (RFU) label will appear.



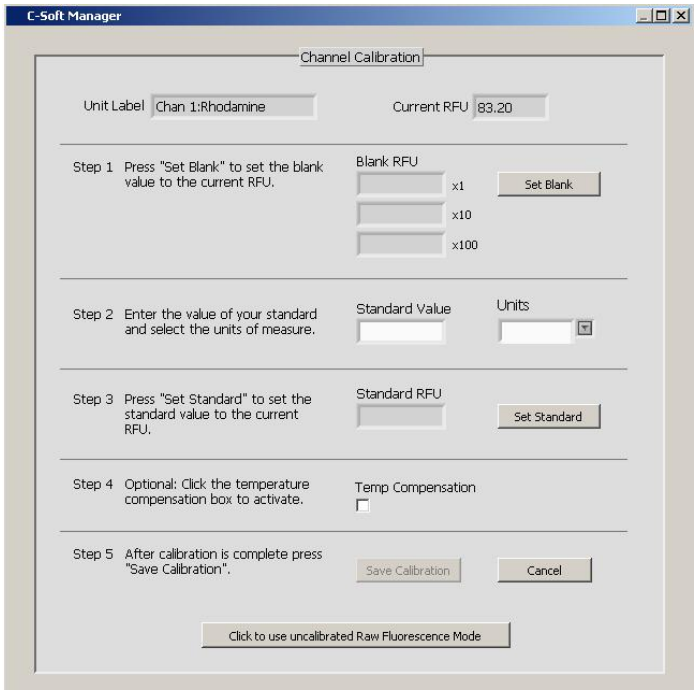
Waveform Screen

- Users can graphically view real-time data for each sensor by clicking the “Display Waveform” box.
- Sensor identification name and units will be displayed on the Y-axis.
- Time and date will be displayed on the X-axis.
- Graphs can be autoscaled by clicking the “Autoscale” box.
- Data can be saved during waveform mode by clicking “Start Data Capture”



Calibration Screen

Users can calibrate Cyclops-7 sensors in either the direct concentration mode, raw fluorescence mode, or blank subtracted raw fluorescence mode.


C-Soft Manager
Channel Calibration
Unit Label
Chan 1:Rhodamine
Current RFU
83.20
Step 1 Press "Set Blank" to set the blank value to the current RFU.
Blank RFU
x1
x10
x100
Set Blank
Step 2 Enter the value of your standard and select the units of measure.
Standard Value
Units
Step 3 Press "Set Standard" to set the standard value to the current RFU.
Standard RFU
Set Standard
Step 4 Optional: Click the temperature compensation box to activate.
Temp Compensation
Step 5 After calibration is complete press "Save Calibration".
Save Calibration
Cancel
Click to use uncalibrated Raw Fluorescence Mode

Direct Concentration Mode
Values reported in the Direct Concentration Mode are scaled to a predetermined standard value and blank subtracted. The equation used to calculate concentrations after calibrating to Direct Concentration Mode is:

$$\frac{\text{Standard Value (units)}}{\text{Standard RFU}} \times \text{RFU Response} = \text{Concentration (units)}$$

Raw Fluorescence Mode Blank Subtracted
Values in the Raw Fluorescence Blank Subtracted Mode are noted as RFUB. It is important to note that these values are blank subtracted but are not scaled to a standard, they are **relative** values.

Raw Fluorescence Mode
Values in the Raw Fluorescence Mode are referred to as "Relative Fluorescence Units" (RFU). It is important to note that these values are not blank subtracted or scaled to a standard, they are **relative** values.

3.2.2.1 Direct Concentration Calibration

Following steps 1-5 will ensure values are reported as Blank subtracted Concentrations in units of choice. See Appendix B for recommended practices.

Step 1: Blanking

- Place the C6 Multi-Sensor Platform and Cyclops-7 sensors in a blank solution.

  Note: A blank solution is a solution without the fluorophore of interest (i.e. de-ionized water, artificial seawater, or filtered seawater)

  Note: Ensure the Cyclops-7 sensors are free of bubbles

- Wait until "Current RFU" readings have stabilized then select the "Set Blank" button to set the blank value.
- Future measurements for this sensor will be blank subtracted based on the blank response recorded during calibration.

Step 2: Standard Value and Units

- Place the C6 Multi-Sensor Platform and Cyclops-7 sensors in a standard solution or use a secondary solid standard (see Appendix D for more information on solid standards).

  Note: Not all sensors are designed with solid standards. See the Cyclops-7 manual for available secondary solid standards.

- Enter the known concentration value of the standard solution in the "Standard Value" box. If the concentration is not known, enter an arbitrary value (i.e. 100).
- Future measurements will be calculated based on the correlated response to the standard value.
- Enter manually or select desired units from the dropdown menu.

  Note: Do not choose or enter "RFUB" if Direct Concentration Mode is used.

Step 3: Set Standard

- When readings in "Current RFU" box have stabilized, select the "Set Standard" button.

Step 4: Optional Temperature Compensation

Temperature compensation is optional and allows the user to automatically compensate to the factory installed temperature sensor. Temperature compensation is available for Chlorophyll a and Rhodamine sensors only. Temperature is displayed in degree Celsius.

- Click on the "Temperature Compensation" box.
- Select either Chlorophyll *a* or Rhodamine fluorophore from the dropdown menu.
- Data will now be corrected for temperature fluctuations.

The temperature compensation coefficients for each fluorophore are listed below.

Fluorophore	Coefficient	
Rhodamine	0.026 per degree C	Exponential
Chlorophyll *a*	1.4% per degree C	Linear

Step 5: Save Calibration

- After calibration is complete select "Save Calibration".
- Data for the selected sensor will now be calibrated.

3.2.2.2 Raw Fluorescence Calibration – Blank Subtracted

Following steps 1-5 will ensure values are reported as Blank subtracted Relative Fluorescence Units (RFUB). See Appendix B for recommended practices.

Step 1: Blanking

- Place the C6 Multi-Sensor Platform and Cyclops-7 sensors in a blank solution.

  Note: A blank solution is a solution without the fluorophore of interest (i.e. de-ionized water, artificial seawater, or filtered seawater)

  Note: Ensure the Cyclops-7 sensors are free of bubbles

- Wait until "Current RFU" readings have stabilized then select the "Set Blank" button to set the blank value.
- Future measurements for this sensor will be blank subtracted based on the blank response recorded during calibration.

Step 2: Selecting Units

- Select RFUB from the units' dropdown menu.

  Note: Do not enter a value in the standard value box.

Step 3: Skip and go to Step 4

Step 4: Optional Temperature Compensation – Follow same steps under the Direct Calibration procedure

Step 5: Save Calibration

- After calibration is complete select "Save Calibration".
- Data for the selected sensor will now be in relative fluorescence units and blank subtracted.

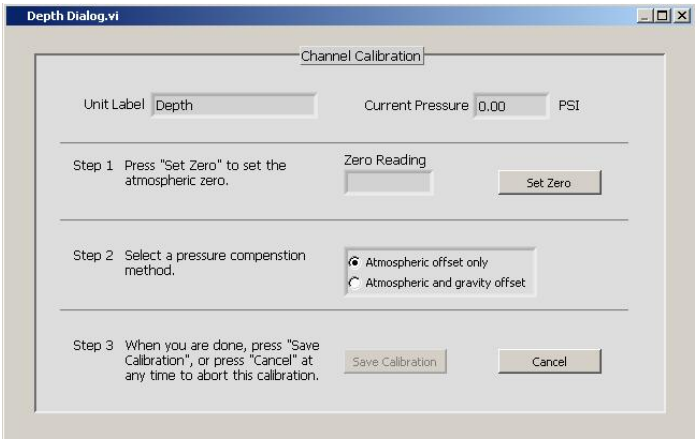
3.2.2.3 Raw Fluorescence Calibration

In the Current Data screen select the “calibrate” button next to a specific Cyclops-7 sensor. At the bottom of the Calibration Screen, click to use “Uncalibrated Raw Fluorescence Mode”. Data for that sensor will be uncalibrated and reported as “Relative Fluorescence Units” (RFU).

3.2.2.4 Depth Calibration

Depth is displayed in meters only. There are two calibration options for depth calibration:

1. The first uses only the atmospheric pressure as an offset. This is suitable for any shallow application, including most fresh water applications.
2. The second compensates for gravity variations with latitude, as designed from the UNESCO Technical Papers in Marine Science #44. This method assumes 0°C and 35PSU salinity.



Atmospheric Offset

Step 1 (Method 1):

- Select the “Calibrate” button for depth in the “Current Data” screen.
- Pressure in PSI will be displayed in the “Current Pressure” window.
- After “Current Pressure” readings are stable at desired location select “Set Zero”.

Step 2 (Method 1):

- Select “Atmospheric offset only”.

Step 3 (Method 1):

- Select “Save Calibration” button.
- Future depth values will be scaled to the offset.

Atmospheric and Gravity Offset

Step 1 (Method 2):

- Select the “Calibrate” button for depth in the “Current Data” screen.
- Pressure in PSI will be displayed in the “Current Pressure” window.
- After “Current Pressure” readings are stable at desired location select “Set Zero”.

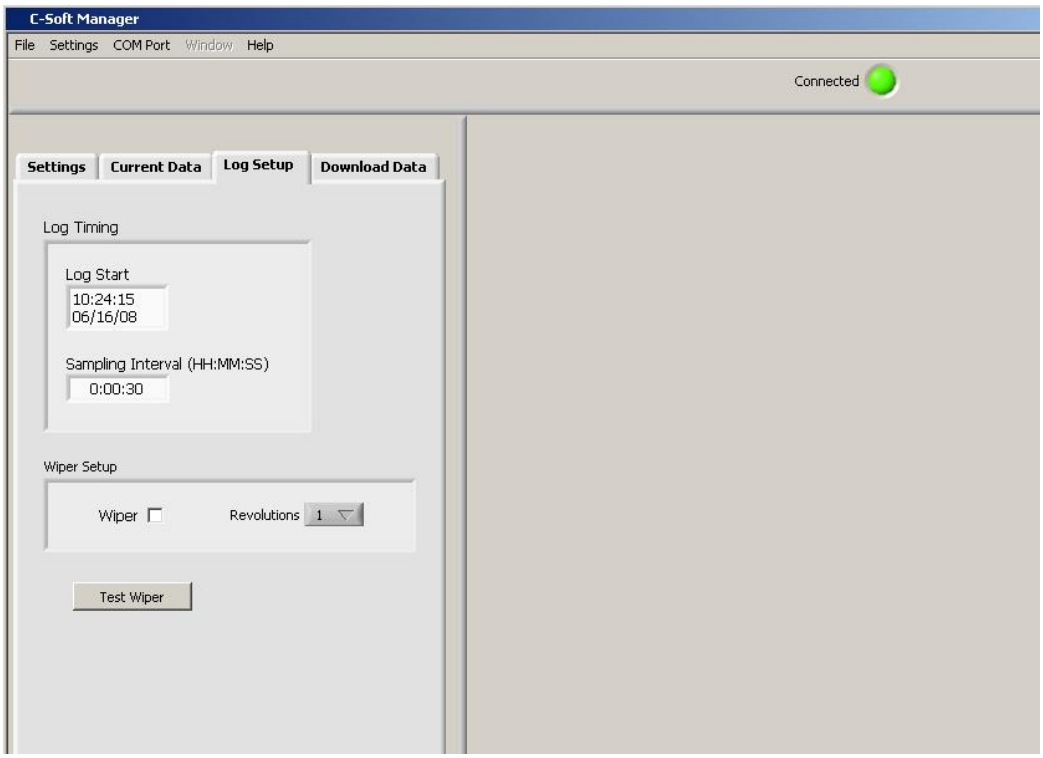
Step 2 (Method 2):
- Select “Atmospheric and gravity offset”.
- Enter the latitude.

Step 3 (Method 2):
- Select “Save Calibration” button.
- Future depth values will be scaled to the offset.

3.2.3 Log Setup Screen

The Log Setup screen allows the user to configure a logging session, activate the wiper, and enable logging. The C6 Multi-Sensor Platform can log just over 64,000 lines of data.

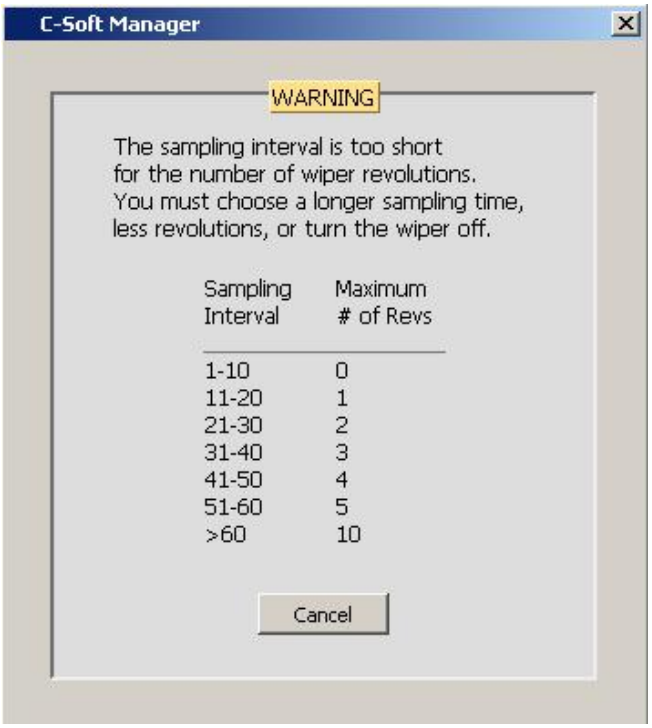
- Enter a log start date (MM/DD/YYYY) and time (HH:MM:SS).



- Enter the sampling interval (HH:MM:SS). The minimum sampling interval is 1 second.

- If the bio-fouling wiper is installed click the “Wiper” box to enable.
- Select the number of revolutions from the dropdown box (1-10 revolutions). All sensors will be wiped at specified revolutions before each measurement.

Note: If users select revolutions that exceed sampling interval a warning message will be displayed.



- After log set up is complete select “Enable Datalog”.
- A prompt will appear asking if user is ready to enable logging, select “Yes”.

Note: If data logging is set to start immediately, there will be a minimum delay of 100 seconds before startup after power has been supplied.

WARNING! As soon as data logging is enabled users will be unable to conduct calibrations or view current data. This should be the last step before the C6 Multi-Sensor Platform is deployed.

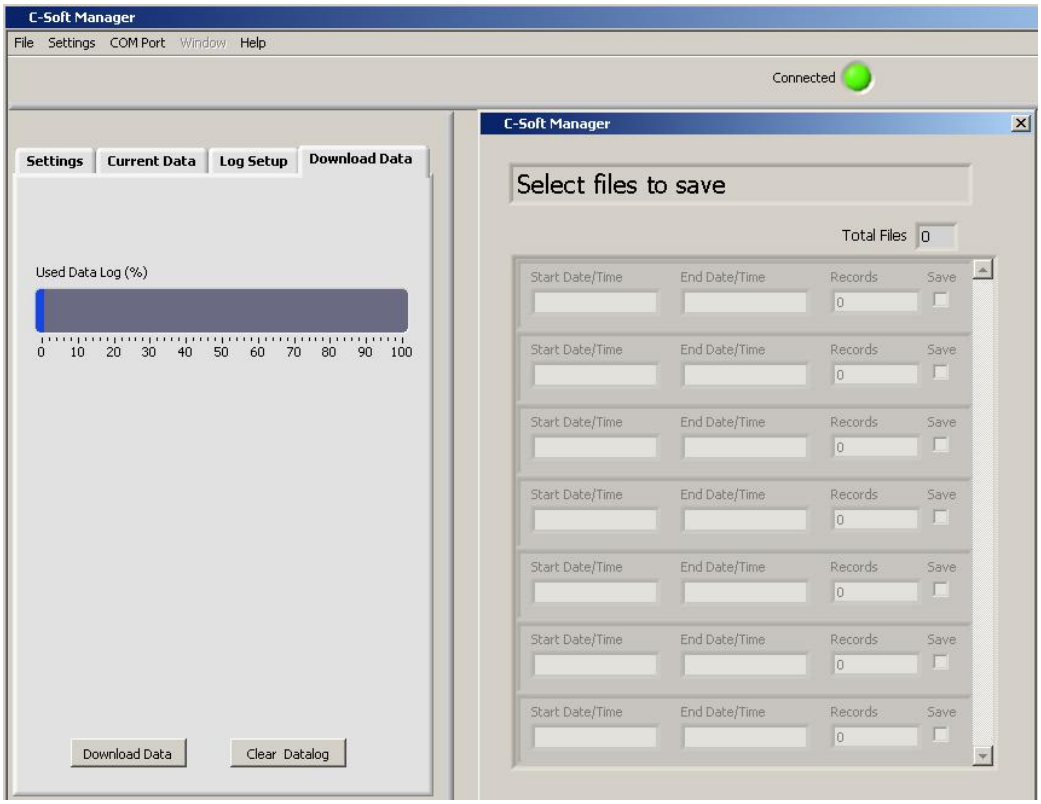
3.2.4 Downloading and File Management

Users can download new and exisiting files saved in the C6 Multi-Sensor Platform.

- Select Download Data.

  Note: This step may take several minutes depending on file size.

- Choose the files to be saved by clicking the “Save” box.
- Users will be promted to chose a folder location where data will be saved.
- Files will be saved in a .CSV format.



- Select “Clear C6 Datalog” to erase existing data from memory.
- Users are able to upload data and view in the “Current Data” window if desired.

3.2.5 Enabling Data Output Ready State

Users interested in integrating the C6 Multi Sensor Platform into CTDs or Third Party Platforms must enable the C6’s Data Output Ready State using C-Soft Software. There are five necessary steps to ensure the instrument is properly setup for data output:

1) Set the instrument's clock to PC or local time in the Settings Tab
2) Select the sensors you expect to use during sampling
3) Calibrate selected sensors for either Direct Concentration Mode or Raw Fluorescence Units Blanked (RFUB) Mode (see section 3.2.2)
4) Set the start time, sampling, and wiping intervals in the Log Setup Tab. *Note: wiping interval is optional and depends on the sampling interval (see section 3.2.3)*
5) Click the 'Enable Datalog' button followed by the 'Yes' button to enable the Data Output Ready State

A few seconds after the 'Yes' button has been clicked to enable the Data Output Ready State, the C-Soft program will automatically shut down and users must disconnect power and serial connections. The instrument is now in the Data Output Ready State and will remain in that state so long as C-Soft is not used to communicate with the instrument. ***Note: As soon as C-Soft is used to communicate with the instrument, users will need to re-set the parameter settings in the Log Setup (section 3.2.3) and again enable datalog to put the instrument into the Data Output Ready State.***

When power is supplied to the instrument while it is in the Data Output Ready State, it will begin streaming data after a 100 second delay. If power is cycled (i.e. disconnected and reconnected) please allow 100 seconds for the data stream to begin.

The C6 Multi Sensor Platform's standard output is in digital (ASCII) format.

Integration Cable for Digital (ASCII) Output

The Integration Cable is recommended for digital integrations with CTDs or Third Party Platforms. This cable is designed so that flow control is disabled; therefore it may only be used for integrations and cannot be used for communicating with the C3. As long as the C3 is in the Data Output Ready State, power is supplied to the instrument, and a 100 second delay has been allowed, the C3 will output digital data continuously without interruptions if the integration cable is used. Using any other cable for digital integrations may cause interruptions caused by hardware flow control. The Integration Cable has 3 connectors:

1) A serial DB9 plug (RS232)
2) A female plug for supplying power to the instrument
3) An 8-pin female connector for connecting to the C3

And can be ordered in either a 2 foot (PN: 2200-160) or 5 meter (PN: 2200-165) cable length. ***Note: The Integration Cable will have a yellow band which distinguishes it from the standard Interface Cable used to communicate with the C3 Submersible Fluorometer.***

After the instrument has been calibrated proceed to Log Setup (Section 3.2.3). After logging has been enabled, the C-Soft software will automatically shut down. Users should disconnect power and communicate with the C6 Multi-Sensor Platform via HyperTerminal serial terminal emulator.

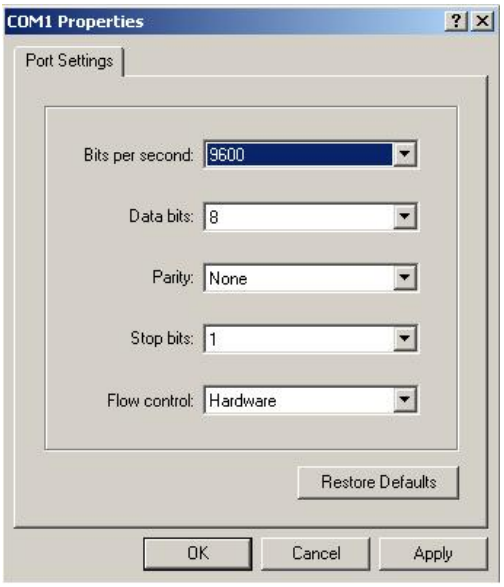
3.2.6 How to setup Hyperterminal for Digital (ASCII) Data Capture

1. On a MS Windows computer, open the HyperTerminal program (Start→All Programs→Accessories→Communications→ HyperTerminal)

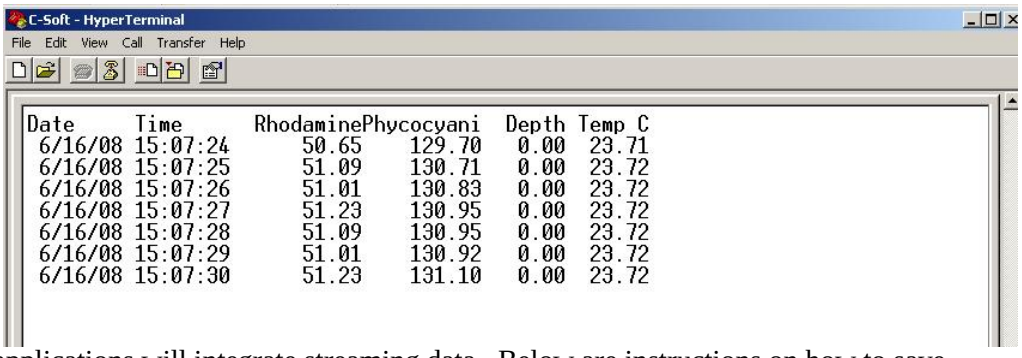
2. The **Connection Description** screen will appear. Name the connection description. This file will save the communication parameters for the C6 Multi-Sensor Platform and can be used in the future to establish communication with the instrument quickly.

3. The **Connect To** screen will appear. Choose the appropriate communications port in the **Connect Using** window. Click **OK**.

4. The **Port Settings** screen will appear. Choose the following port settings;
   Bits per second: 9600
   Data bits: 8
   Parity: None
   Stop bits: 1
   Flow control: Hardware
   Click **Apply** and **OK**

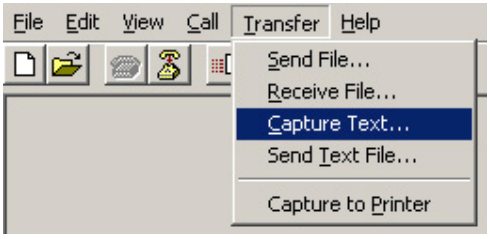


5. The **HyperTerminal** window will appear. You are now ready to connect C6 Multi-Sensor Platform to a power source. Data will be displayed at set intervals, in the HyperTerminal window, after a 100 second delay or at the specified log start time.

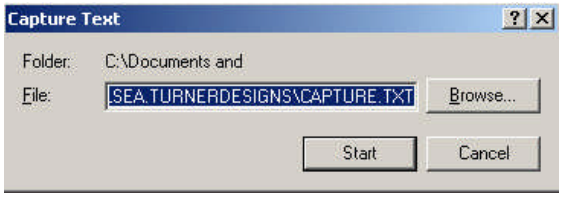


Most applications will integrate streaming data. Below are instructions on how to save streaming data on a PC.

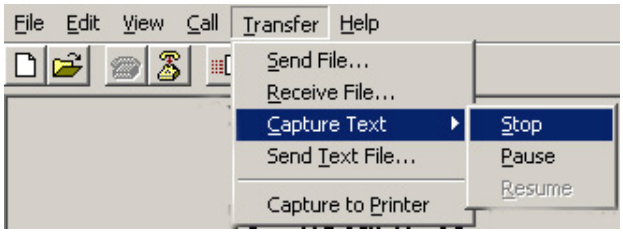
To save data:
1. On the HyperTerminal window toolbar, choose Transfer and then Capture Text



2. When you click on Capture Text, a window will appear asking you to name and save the .txt file to the location of interest.



3. Once you are finished, you will need to return to the HyperTerminal window toolbar, choose **Transfer** and then **Capture Text** and select **Stop.** This will stop data capture to the **.txt** file.



4.0 Deployment

4.1 Connecting the Submersible Battery Pack

The Battery Pack comes with a 12-inch cable and a charger. The 12-inch cable is not needed if the optional battery bracket is installed. The battery is fully charged after 8 hours.

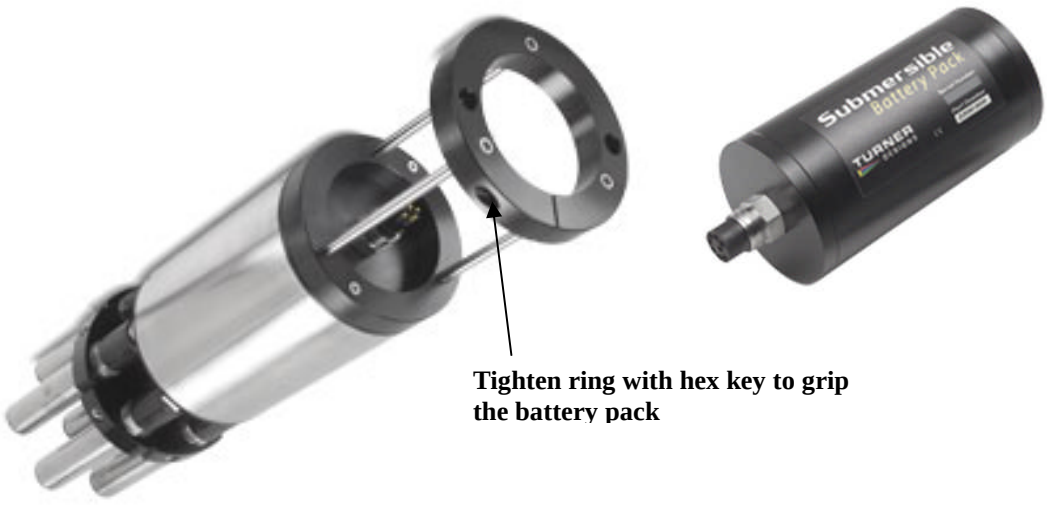
- After data logging is enabled attach the battery to the C6 Multi-Sensor Platform with the 12-inch cable or via battery bracket.
- Secure C6 Multi-Sensor Platform and battery to a fixed structure.
- Data logging will begin at specified time and date.

Note: The battery is rated for 10,000 data lines, each data line can range from 3-9 data points

4.2 Battery Bracket Installation

The optional battery bracket was designed for easy self-contained compact deployment of the C6 Multi-Sensor Platform. The 12-inch cable is not needed if the battery bracket is installed.

1. Remove the 2 eyelifts located at the top of the C6 Multi-Sensor Platform housing using a screwdriver.
2. Align the bracket holes with the threaded eye lift holes.
3. Using the screws, included in the bracket package, fasten the brace to the C6 Multi-Sensor Platform housing.
4. Glide the battery pack through the brace towards the C6 Multi-Sensor Platform 8-pin connector.
5. Align the 8-pin connector and battery and secure.
6. Ensure the battery is completely mated before next step.
7. After installing the battery pack use a hex key to tighten the battery ring.



Tighten ring with hex key to grip the battery pack

5.0 Maintenance and Warranty

5.1. Rinsing

The C6 Multi-Sensor Platform should be rinsed or soaked in freshwater following each deployment.

5.2 Care for the bulkhead connector

Install the 8-pin female end plug to the bulkhead between uses. A light coat of Silicone based grease should be used on the rubber of the male pins of the bulkhead to aid in sealing.

5.3 Care for the sensor ports

Install 6-pin male plugs into any vacant port. A light coat of Silicone based grease should be used on the rubber of the 6-pin port end to aid in sealing.

5.4 Terms

Turner Designs warrants the C6 and accessories to be free from defects in materials and workmanship under normal use and service for a period of 12 months from the date of shipment from Turner Designs with the following restrictions:

- Turner Designs is not responsible for replacing parts damaged by accident or neglect. Your instrument must be installed according to instructions in the User's Manual. Damage from corrosion is not covered. Damage caused by customer modification of the instrument is not covered.

- This warranty covers only Turner Designs products and is not extended to equipment used with our products. We are not responsible for accidental or consequential damages, except in those states where this limitation is not allowed. This warranty gives you specific legal rights and you may have other rights which vary from state to state.

- Damage incurred in shipping is not covered.

5.5 Warranty Service

To obtain service during the warranty period, the owner shall take the following steps:

1. Write, email or call the Turner Designs Technical Support department and describe as precisely as possible the nature of the problem.

Phone: 1 (877) 316-8049
Email: support@turnerdesigns.com

2. Carry out any adjustments or tests as suggested by the Technical Support Department.

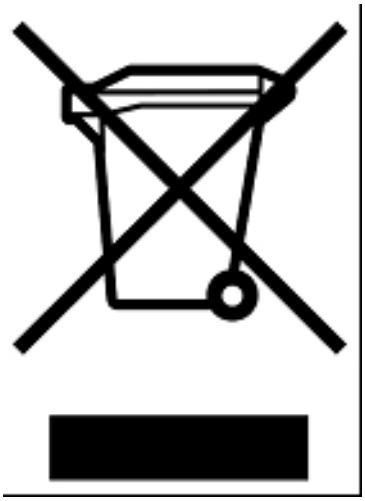
3. If proper performance is not obtained you will be issued a Return Materials Authorization number (RMA) to reference. Package the unit, write the RMA number on the outside of the shipping carton, and ship the instrument, prepaid, to Turner Designs. If the failure is covered under the warranty terms, the instrument will be repaired and returned free of charge, for all customers in the contiguous continental United States.

For customers outside of the contiguous continental United States who purchased equipment from one of our authorized distributors, contact the distributor. If you purchased directly, contact us. We will repair the instrument at no charge. Customer pays for shipping duties and documentation to Turner Designs. Turner Designs pays for return shipment (custom duties, taxes and fees are the responsibility of the customer).

5.6 Out-of-Warranty Service

Follow steps for Warranty Service as listed above. If our Technical Support department can assist you by phone or correspondence, we will be glad to, at no charge. Repair service will be billed on a fixed price basis, plus any applicable duties and/or taxes. Shipment to Turner Designs should be prepaid. Your bill will include return shipment freight charges.

Address for Shipment:
Turner Designs, Inc.
845 W. Maude Ave.
Sunnyvale, CA 94085



Equipment Specified as Electrical and Electronic Waste

Appendix A. Specifications

C6 Multi-Sensor Platform	
Weight in Air	2.7 kg 6.0 lbs (without sensors, submersible battery, or wiper)
Weight in Water	1.6 kg 3.4 lbs
Length	25.8 cm 10.2 in
Length with Sensors Attached	33.8 cm 13.3 in
Diameter	10.2 cm 4.0 in
Material	316 Stainless Steel; Delrin
Temperature	-2 to 50 degrees C.
Depth	600 meters
External Power	8 to 30 VDC
Signal Output	Digital
Interface	RS232 (USB Adaptor)
Maximum Sampling Rate	1 second
Nonvolatile Memory	64,000 Data Lines

Submersible Battery Pack	
Battery	Lithium-Ion
Weight in Air	0.75 kg (1.65 lbs)
Weight in Water	0.22 kg (0.50 lbs)
Length	13.46cm (5.3 in)
Diameter	7 cm (2.75 in)
Material	Delrin
Temperature	-2 to 50 degrees C.
Depth	600 meters
Capacity	2,200 mAH
Voltage Output	14.8V nominal
Protection Features	Protects against: overcharge, over-discharge,overheating, short-circuiting

Appendix B. C6 Multi-Sensor Platform Operating Instructions

Description

The Turner Designs C6 Multi-Sensor Platform can be used with Cyclops-7 sensors for many different applications. It can also be integrated into a multi-parameter system. It is capable of logging and storing data and uses algorithms to compute direct concentrations of fluorophores.

Identification

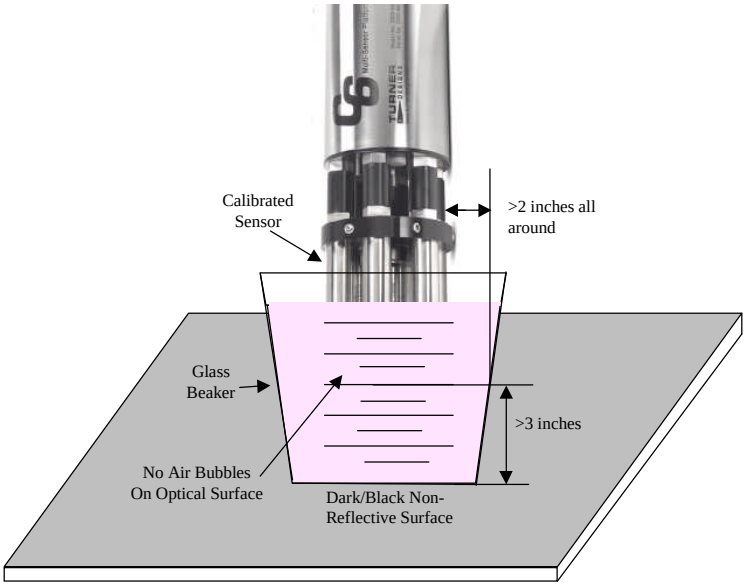
- Each Cyclops-7 Sensor is identified by a letter stamped into the connector.

"C" = Chlorophyll, "U" = CDOM, "O" = Crude Oil, "F" = Fluorescein, "B" = Optical Brighteners, "P" = Phycocyanin "E" = Phycoerythrin, "R" = Rhodamine, "T"= Turbidity, and "G" = Refined Oil/Fuels.

Recommended Measurement Practices

The following steps will improve the accuracy and repeatability of your measurements, especially at low concentration levels:

1. Use a **Glass Beaker** for your water samples. (Avoid plastic beakers – plastic may fluoresce and might interfere with measurements).
2. Place the glass beaker on a **non-reflective surface**, preferably black.
3. Ensure that the sensor is **more than 3 inches above the bottom** of the glass beaker.
4. Ensure that the sensor is in the center of the glass beaker, and has **more than 2 inches clearance** between the sensor and the inside surface of the beaker.
5. Check that the optical surface of the sensor is **free of air bubbles**.

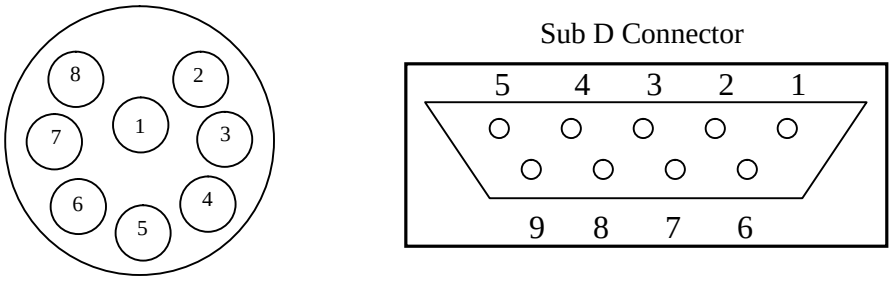


Appendix C. C6 Multi-Sensor Platform Wiring Guide

The C6 Multi-Sensor Platform outputs digital data in a format that can be read by C-Soft software or a terminal emulator program. It can be integrated into larger multi parameter systems such as CTDs or buoys.

An 8-pin impulse cable provides two end connections: 1) a 9-pin RS232 serial port for connection to a PC or laptop computer and 2) a 12V port for supplying power to the unit.

C6 Multi Sensor Platform bulkhead and serial port connectors



Wire Guide

Pin Out	*Color*	*C6 Function*	*Corresponding Sub D Connector Pin*
1	Black	V BATT (+)	Power Connector Cable–Center Pin (+)
2	White	V BATT (-)	Power Connector Cable–Housing (-)
3	Red	GND	PIN 5
4	Green	RX	PIN 2
5	Blue	TX	PIN 3
6	Brown	DTR & DSR	PIN 4, 6
7	Yellow	RTS & CTS	PIN 7, 8
8	Orange	N/A	N/A

Appendix D. Using the Secondary Standard

The following information will describe how to use the Solid Secondary Standard, P/N 2100-900, with Cyclops-7 sensors.
Note: The Turbidity Cyclops does not have a solid secondary standard.

Solid Secondary Standard Benefits:

1. It can be used in place of a primary liquid standard once a correlation between a primary standard and the solid standard has been established.
2. It can be used to check the stability of the instrument, and/or check for loss in sensitivity resulting from the growth of bio-fouling organisms on the sensor optics.

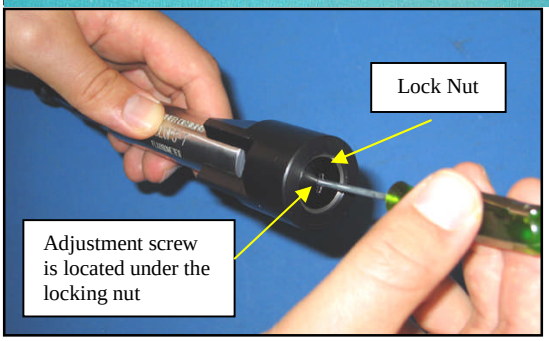
The Solid Secondary Standard provides a very stable fluorescent signal. It has an adjustment screw so that you can tune the Solid Standard to provide a signal to match a specific sample.

Installing the Secondary Standard

1. Before installing the Solid Standard you must ensure that the optical surface of the Cyclops-7 is completely clean and dry. The Solid Standard is indexed and it must be installed so that the indexing is precisely aligned for proper use (see below).

2. To install, place the Solid Standard on to the optical end of the Cyclops-7.

Align the index mark and indexing ball when installing Cyclops-*7 in the Solid Secondary Standard.*



Insert the supplied green screwdriver through the calibration hole in the locking nut to reach the adjustment screw.

3. With the Solid Standard fully mated with the sensor head, rotate in either direction until you feel the Solid Standard indexing ball click into the indexing mark on the Cyclops-7.

4. To begin, use a flat-head screwdriver to unscrew the locking nut as far as it will go.

5. Next, to change the signal level, use the green screwdriver provided and insert the blade through the hole in the locking nut. Rotate it until it engages with the adjustment screw that is beneath the locking nut. Now the screw can be used to adjust the signal level as necessary.

6. Once the desired reading has been obtained, the locking nut should be screwed down so that the adjustment screw is held firmly in place.

7. Note that the response of every solid standard is unique. Hence, a new correlation must be determined for every sensor. For future identification, use the "ID" space on the label for a unique identifier for the Secondary Standard.

Use of the Solid Secondary Standard:

The Solid Secondary Standard can be use to:

- Check signal stability
- Determine drift
- Recalibrate

1. To establish a correlation between a known concentration and it's respective fluorescence output immerse the sensor in a sample with a known concentration of your fluorophore.
2. Dry off the C3 Submersible Fluorometer's optics, attach the Solid Standard, and adjust the Solid Standard to produce the same fluorescence output value from the sensor as in step 1, (turning the Secondary Standard adjustment screw clockwise produces a higher signal).
3. Now your Solid Secondary Standard has been correlated to a known concentration and as long as it is no longer adjusted, stored and used properly that signal will remain a stable reference point.

4. Comprehensive information on fluorescence applications

   http://www.turnerdesigns.com/t2/doc/appnotes/main.html#fluorescent

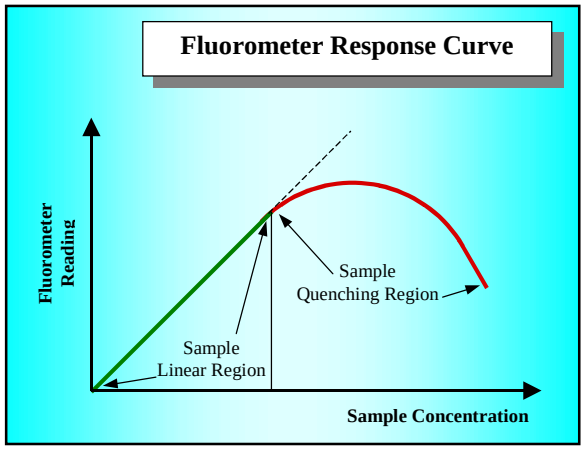
Note: There are no Solid Secondary Standards available for the Turbidity or UV optical sensors.

Linear Range and Quenching

The linear range is the concentration range in which the Cyclops-7 output is directly proportional to the concentration of the signal. The linear range begins with the smallest detectable concentration and spans to an upper limit (concentration) that is dependent upon the properties of the material, filters used, and path length.

A non-linear relationship is seen at very high concentrations where the signal does not increase at a constant rate in comparison to the change in concentration, see figure below. At even higher concentrations, the signal will decrease even though the sample concentrations are continuing to increase. This effect is known as "signal quenching".

Linearity can be checked by diluting a sample 1:1 or some other convenient ratio. If the sample is still in the linear range, the reading will decrease in direct proportion to the dilution. If the reading does not decrease in direct proportion to the dilution, or if the reading increases, the sample is beyond the linear range.



Graph showing Linear and Quenching Regions of the sample's response

Temperature Considerations

Fluorescence is temperature sensitive. As the temperature of the sample increases, the fluorescence decreases. For greatest accuracy, record the sample temperature and correct the sensor output for changes in temperature.

For further information on how temperature, light, water quality and the physiological state of the algal cells can all affect the measurement of chlorophyll *a*, please refer to the application section of Turner Designs' web site at the following URL:

http://www.turnerdesigns.com/esupport/understanding.html